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Yuichi Fujioka

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EXAMINER

MCCRACKEN, DANIEL

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,151	Applicant(s) FUJIOKA ET AL.	
	Examiner DANIEL C. MCCracken	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/23/2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 54-56 and 58-111 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 54-56 and 58-111 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/23/2008</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Response to Arguments

Applicants amendments to the Claims and Specification have been received and will be entered.

Claim Rejections – 35 U.S.C. §112

Applicants arguments in light of their amendments are persuasive. Accordingly, the rejections are WITHDRAWN. That said, the claims might not mean what Applicants intend them to mean. This issue is elaborated on *infra*.

Claim Rejections – 35 U.S.C. §§102-103

Applicants have amended all independent claims to recite features or create embodiments not previously claimed. The claims define the invention. 35 U.S.C. 112, ¶2. As the prior rejections were crafted towards different inventions, they are WITHDRAWN in light of Applicants amendment. New rejections appear *infra* to address Applicants amendments. That

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said, in the interest of advancing prosecution, the Examiner makes the following remarks in response to Applicants arguments:

The issue with the claims, as Applicants have written them, is they arguably read on any number of “carbon nanofibers.” As Applicants would appear to recognize at *e.g.* (S. 1: 2 *et seq.*), they are not the first to make carbon nanofibers. The prior art is littered with patents and journal articles describing carbon nanofibers. Applicants listing in the specification is a fair representation: Hyperion/Moy/Tennent, Baker/Rodriguez, in addition to a throng of Japanese research teams and manufacturers. Unfortunately, this field suffers from a horrible lack of agreement on terminology. One artisan’s “nanofiber” is the others artisan's “nanotube, nanorope, nanoribbon, nanocarbon,” etc., etc. Giving a “meaning” to this terminology is difficult due to the divergent usages in the field. Add on top of that translation issues, and examination of this art can be exceptionally difficult. Typically, “nanotubes” are thought of as having a “tubular” morphology, that is formed by concentric shells or layers of a graphene sheet. “Nanofibers” generally refer to non-tubular carbon filaments with a variety of "sub-morphologies" including platelet, herringbone, etc., where each morphology refers to the arrangement of the graphite layers in the fiber. To their credit, Applicants appear to recognize this in their discussion at (S. 2: 1) (note, the Examiner is referring to the Specification as originally filed).

Against this backdrop the "patenting issues" come to light. As now claimed, the independent claims (Claims 54 and 72) recite a plurality of *rods* gathered together with each rod having a central axis and axial end as well as portions with 2-12 hexagonal carbon layers. This “rod” language is exactly the type of language the Examiner was referring to above with respect to the lack of agreement in terminology. However, the language is understood here, and

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presumably employed (as is good claiming practice) to cover all of the embodiments disclosed (for example those disclosed in "Fig. 4"). Any bundle of carbon nanotubes (and indeed anything for that matter) has an axis and end portions. Thus this language, while considered, doesn't really add anything of patentable significance for those reasons: everything has an axis, and everything has an end portion. As to the "2-12 hexagonal carbon layers" portion of the claim, many papers refer to carbon nanotubes as "coaxial closed layer[s] of carbon hexagons." This language comes from Iijima's seminal paper on carbon nanotubes: *Helical microtubules of graphitic carbon*, Nature 1991; 354: 56-58. Applicants cited this paper on the latest IDS. Thus, Claim 54 reads (after Applicants most recent amendment) on a collection of multi-walled nanotubes. The "hexagonal carbon layers" limitation can be properly construed as the walls of a multiwall carbon nanotube.

When examined with respect to other morphologies of fibers or "rods," this "2-12 hexagonal carbon layer" language is not understood. Specifically, with respect to the "columnar" and "feather/herringbone" morphologies disclosed and claimed in *e.g.* Claims 63-65, these fibers would appear to have layers extending in more than one direction, as opposed to what is required of required by Claim 54. Are "layers" the same as platelets?

Upon reconsideration of the case, one additional issue is not fully understood. In Applicants' discussion of Figures 1-4 beginning at (S. 25: 2), Applicants use "11" to designate the carbon layers in their figures. Figure 4 would appear to indicate that these layers are in fact parallel to the axis of the fiber as opposed to orthogonal or some other "non-90" degree angle (as in the case of a herringbone fiber). This would appear to be in stark contrast to the prior art (*e.g.* Rodriguez) and even Applicants own micrographs.

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With respect to Applicants arguments traversing inherency, Applicants allege they do not have the burden of proof. This is not persuasive for any number of reasons, not the least of which is that Applicants process – insofar as the Examiner can determine – is the ubiquitous “hydrocarbon + iron group (Fe, Co, Ni) catalyst + heat = nanofiber” method. The Examiner is not relying on “probabilities” or “possibilities” as insinuated by Applicants footnote. Catalysts behave the same regardless of who (Resasco, Baker/Rodriguez, Moy/Tennent, or Applicants) is using them. Why wouldn’t Resasco produce Applicants nanofibers, especially since Applicants claimed nanofibers read on multi-walled nanotubes? Applicants arguments that Resasco makes something else are hardly persuasive. Claims 54 and 72 (and indeed the previously filed claims) only required multiwall nanotubes, clearly taught by Resasco.

Applicants do not appear to present any arguments directed to the apparatus claims, instead converting them to method claims. The Examiner presumes the prior analysis was correct. With respect to the fibers, Applicants are free to claim as they see fit, however the Examiner will not import one disclosed embodiment into the claim. As drafted and in light of the Specification, the fiber terms in the claims are not clear. As such, rejections under 35 USC 112 are made, *infra*. With respect to the art rejections, the objective reach of the claim controls.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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Claims 54-56, and 58-111 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The newly claimed embodiment with a plurality of rods bundled together and each having 2-12 layers – insofar as the examiner can determine - does not draw support in the specification as filed with the specificity needed to demonstrate possession. All dependent claims import the defects associated with the independent claims.

Claims 54-56, and 58-111 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification lacks guidance as to practice the invention with the specificity claimed, specifically limiting each of the “rods” that constitute the aggregate by the number of “layers” present in each rod. Such information as the interrelationship between catalyst size, temperatures, pressures, flow rates, residence time, etc. is needed. Furthermore, the various morphologies claimed in various dependent claims (e.g. Claims 63-65) don’t really make sense with the claim they depend from? How do you have a herringbone carbon fiber with “layers” (commonly referred to in the art as “platelets”) extending in only one direction. Likewise, for

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any of the non-tubular morphologies claimed, if Applicants are limiting their “rod” to at a maximum of 12 platelets, which typically have 0.34 nm of spacing between the layers, is it really proper to call it a “rod?” Furthermore, with only 2-12 layers, can you really achieve the lengths claimed in Claim 2, which require at minimum 2 nm? And achieve the morphologies shown in *e.g.* “Fig. 2?”

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 54-56, and 58-111 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

At issue is the “2-12 layer” and “in one direction” limitations present in the independent claims. It is not understood whether applicants mean layers or platelets, and if they mean both, whether various dependent claims reciting particular dimensions or morphologies even make sense. It is not clear what features Applicants are trying to claim. For example, how does Claim 56 limit Claim 54?

Claims 54-56, and 58-111 are rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. Evidence that claims 54 and 72 fail(s) to correspond in scope with that which applicant(s) regard as the invention can be found in the reply filed 10/23/2008. In that paper, applicant has stated they are not making carbon nanotubes (Remarks of 10/23/2008 at 18 – distinguishing from Resasco, implying that

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nano-fibrous-rods are not the same as carbon nanotubes), and this statement indicates that the invention is different from what is defined in the claim(s) because Applicants disclose embodiments that do include carbon nanotubes. *See e.g.* (S. 26: 3 *et seq.*; "Fig 4").

Claim Rejections - 35 USC § 102-103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The rejections as set forth in the non-final office action dated 6/23/2008 are expressly incorporated herein by reference.

Applicants amendments converting the apparatus claims into method claims do so in a non-substantive way, *i.e.* "a method wherein a reactor having x, y, and z is used." The prior analysis is relied upon.

Rodriguez appears to disclose the plurality of "rods" now claimed. *See* "Figs." Likewise, Resasco teaches an industrial scale process for making multiwalled nanotubes. The process of Resasco doesn't make just one nanotube, it makes many, and as such it is expected that the plurality of nano-fibrous rods limitation is met. Notwithstanding all of the ambiguities over what is a layer or platelet, what orientation they are to have, what dimensions they are to have, etc., it is expected that this limitation is taught or obvious over Rodriguez and Resasco. Rodriguez was applied because it appeared to teach all of the disclosed morphologies. Resasco was applied because it is a leading patent on fluidized bed methods for making nanotubes, which also appeared to be disclosed. To the extent the size (whatever it means as claimed in light of the

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specification) is not taught, this is not inventive. Nanotube diameter is a function of catalyst size, and the Examiner takes official notice that it is. In support of taking official notice (*i.e.* in making sure there is “substantial evidence” on the record), the Examiner provides Dai, et al., *Single-wall nanotubes produced by metal-catalyzed disproportionation of carbon monoxide*, Chemical Physics Letters 1996; 260: 471-475. *See* discussion at p. 474 related to diameter and catalyst.

Conclusion

The claim amendments were not understood in light of the disclosure. The disclosure as filed was difficult to read. Applicants have corrected some of the idiomatic issues associated with the language, but it still remains difficult to unravel. Unconventional terminology (which, for this art, one could argue is conventional) was employed, and the drawings further obfuscate what is being claimed. Applicants are reminded of the passage in MPEP 714.02 which states “Applicant should also specifically point out the support for any amendments made to the disclosure.” Applicants did not do so in their reply. The Examiner expects compliance with this provision in the future. It is necessary for a “prompt development of a clear issue.” *Id.*

Interviews after final rejection are discretionary. MPEP 713.01 III (“Examiners *may* grant one interview after final rejection.”). That said, the Examiner will grant an after-final interview, provided Applicants American counsel comes prepared to discuss the case. By “comes prepared to discuss the case,” the Examiner means that the prosecuting attorney will have a familiarity with the Specification, the Claims, and what Applicants are seeking to claim. It would appear as if some language or translation issues might be present that are best resolved in an

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interview. That said, the Examiner reserves the right to refuse entry of any after-final amendment and reserves the right to make any additional rejections under Title 35, U.S. Code as may be appropriate.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
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Examiner, Art Unit 1793
DCM

/Edward M. Johnson/
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